January 2025

2024 Environmental Data Center Report

Oct 1, 2023 - Sep 30, 2024 Report

Amanda Young

EDC Mission Statement

- The EDC was developed to meet the needs of the scientific community.
- Mission:
  - Collect and manage long-term baseline environmental and biological data
  - Maintain a suite of common-use lab and field equipment
  - Assist in the collection of data through fieldwork assistance & Remote Access

Staffing

EDC Year-round Staff

Amanda Young – Spatial and Environmental Data Center Manager

- PhD in physical geography
- Enjoys working with plants and data

Mayra Melendez-Gonzalez – EDC Technician

- BS in Biological Sciences
- Background in Arctic and alpine ecology with a keen skillset in instrumentation and aquatic sampling

Abby Jackson – EDC Technician

- MS in Ecology
- Background in soils ecology of cold climates with a special inkling for nematodes

Colin Edgar – Met Station Technician (0.25 time)

- Background in instrumentation, renewable energy, and eddy covariance measurements

Seasonal Staff

Seasonal Technicians

- Sara de Sobrino
  - Plant ecology
- Lela Forester
  - UAF undergraduate student in Natural Resource Management

Naturalist

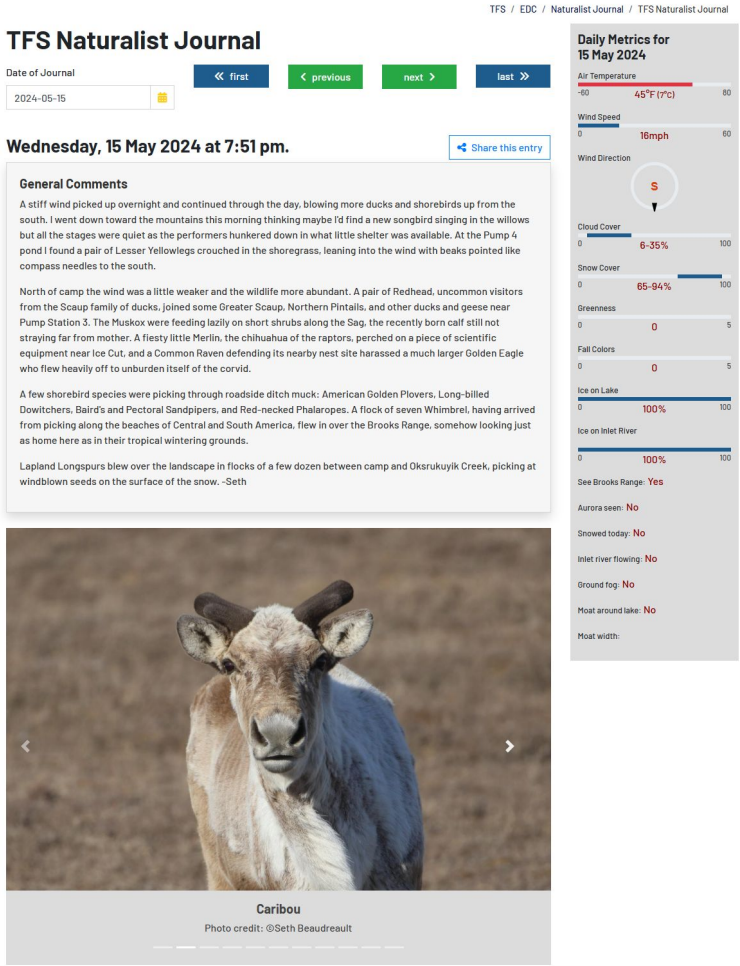
- Seth Beaudreault
  - Animal and birder extraordinaire
  - Worked at Toolik since 2014

Data and Equipment Use

Naturalist Journal

- Remains the top page from the TFS website to be visited.
- Consistent viewership over the past three years.

Year	Views	Unique IP's	Time Viewing	Interactions
2021-2022	10,803	1,754	5m 37s	29,918
2022-2023	12,016	2,067	5m 45s	33,711
2023-2024	11,922	1,521	7m 07s	31,177



Data Usage

EDC Webpage and Direct Requests

- Met station data requests 632 by 72 1591

File
Downloads
People
Views

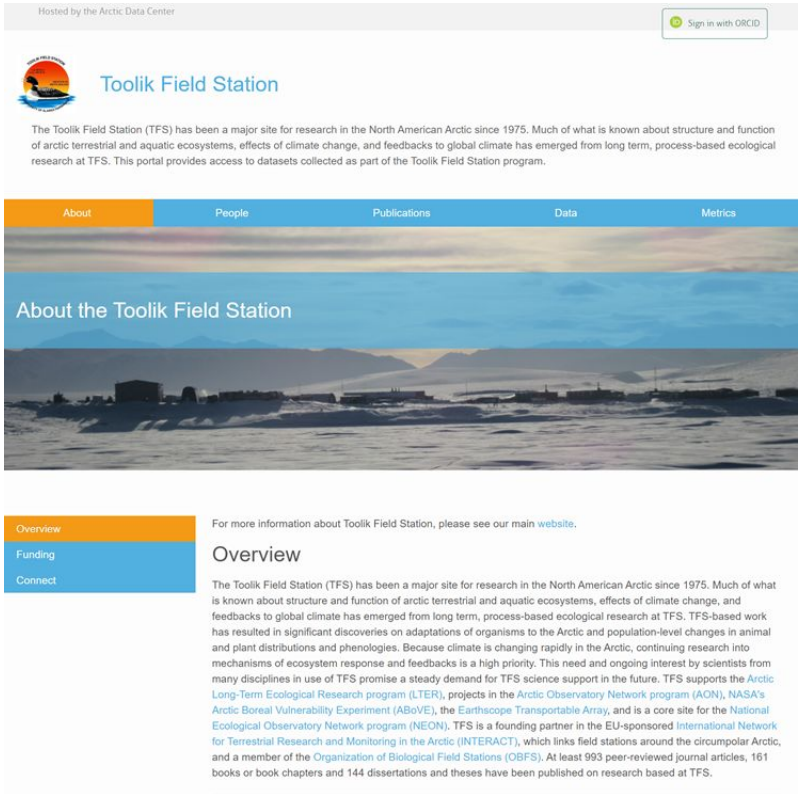
Arctic Data Center (data has DOI)

Phenology	189	371
Bird Point Counts	154	79
Met Station data	15	49
Naturalist Journal – Birds	0	80
Naturalist Journal – Mammals	32	70
Naturalist Journal – Insects	0	66

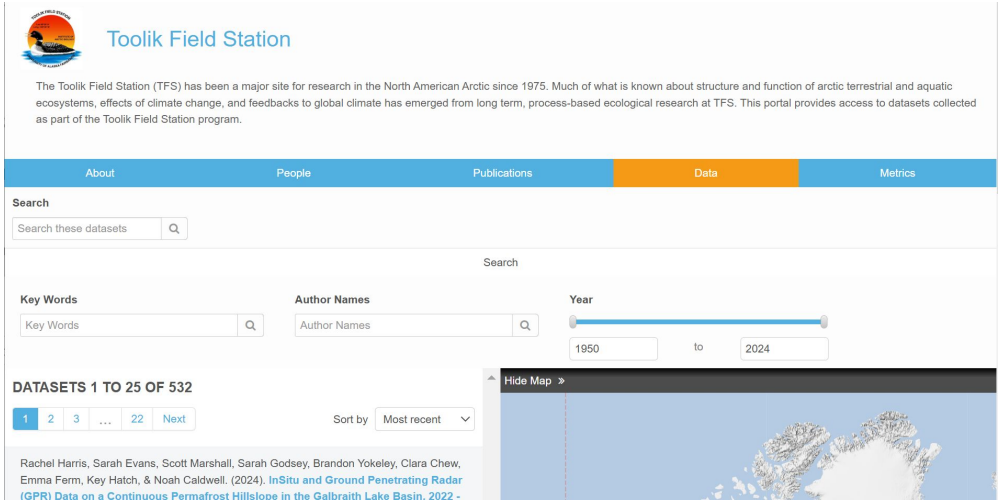
NSF Arctic Data Center

Phenology and Bird Point count datasets updated
Met Station and Naturalist Journal occurring post new years

Arctic Data Center Portal



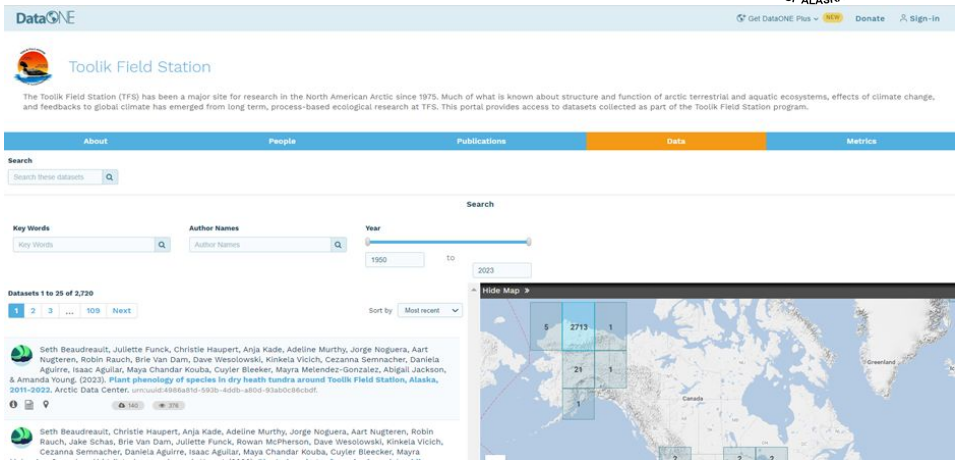
41 datasets added in 2024



[Toolik Arctic Data Center portal]

DataOne Toolik Portal

- Working with DataONE programmers, we duplicated the Arctic Data Center (ADC) portal to encompass all of DataONE repositories
  - ADC, EDI, NEON, USGS, LTER, etc.
  - Datasets in the portal grew from 532 datasets in the ADC portal to 2768 datasets!
- If these portals are used and appreciated by the community, we will keep them up.



[Toolik DataONE portal]

Data and Equipment in Use in Publications

88 publications in 2021
84 publications in 2022
66 publications in 2023
72 publications in 2024

Recovery of metabolites via subnivean photosynthesis in Arctic tundra plants: Implications for climate change

Nicholas Wright-Osment[1] | Christina Lynn Staudhammer[1] |
Steve Oberbauer[2] | Behzad Mortazavi[1] | Gregory Starr[1]

Arctic Heatwaves Could Significantly Influence the Isoprene Emissions From Shrubs

Hui Wang[1], Allison Welch[1], Sanjeevi Nagalingam[1], Christopher Leong[1],
Pitchayawee Kittitananuvong[1], Kelley C. Barsanti[2,3], Rebecca J. Sheesley[4], Claudia I. Czimczik[1],

Photofate of Tetrabromobisphenol-A in the Arctic: Role of photofluence and dissolved organic matter

Robyn C. O'Halloran[a], Jill Kerrigan[a], Lauren E. O'Connor[a], Jennifer J. Guerard[b], Kimberly J. Hageman[c], and Yu-Ping Chin[a]

Wolverine population density and home range size in Arctic Alaska

Thomas W. Glass[1] | Martin D. Robards[2]

Decoupling of redox processes from soil saturation in Arctic tundra

Erin C. Rooney[1,2], Erin VanderJeugdt[3], Sumant Avasarala[1,7], Imtiaz Miah[4,5], Matthew J. Berens[6],
Lauren Kinsman-Costello[3], Michael N. Weintraub[4] & Elizabeth M. Herndon[1,8]

Direction Finding Studies of Simultaneous Auroral $2f_{ce}$ and $3f_{ce}$ Roar Cyclotron Harmonic Radio Emissions

T. M. Godfrey[1] and J. LaBelle[1]

Effects of short- and long-term experimental warming on plant–pollinator interactions and floral rewards in the Low Arctic

Roxaneh S. Khorsand[a], Flavia Sancier-Barbosa[b], Jeremy L. May[c,d], Toke T. Høye[e], and Steven F. Oberbauer[c]

Common Use Equipment

New Equipment

- New federal snow auger
- Ultrasonic cleaner

New to the EDC

- Ekman Grab Sampler - rehab
- Peristaltic pumps
- Few types of fishing nets
- Laminar flow fume hood
- Russian Peat Borer
- Soil Recovery Probes
- Vacuum Pump

Suggested new equipment

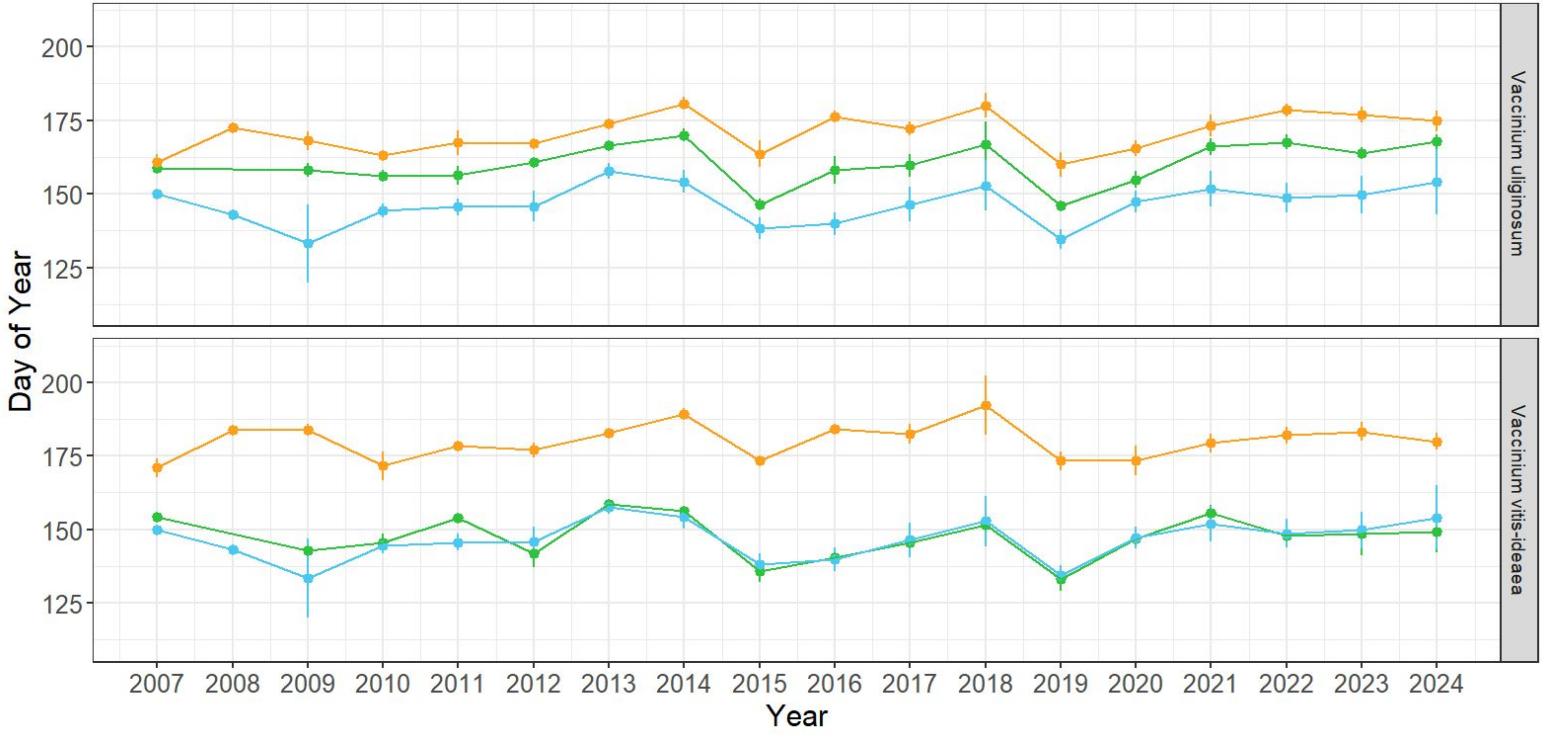
- New freeze dryer
- Shelf for the muffle furnace
- LI-600 fluorometer/ porometer

Science SCUA

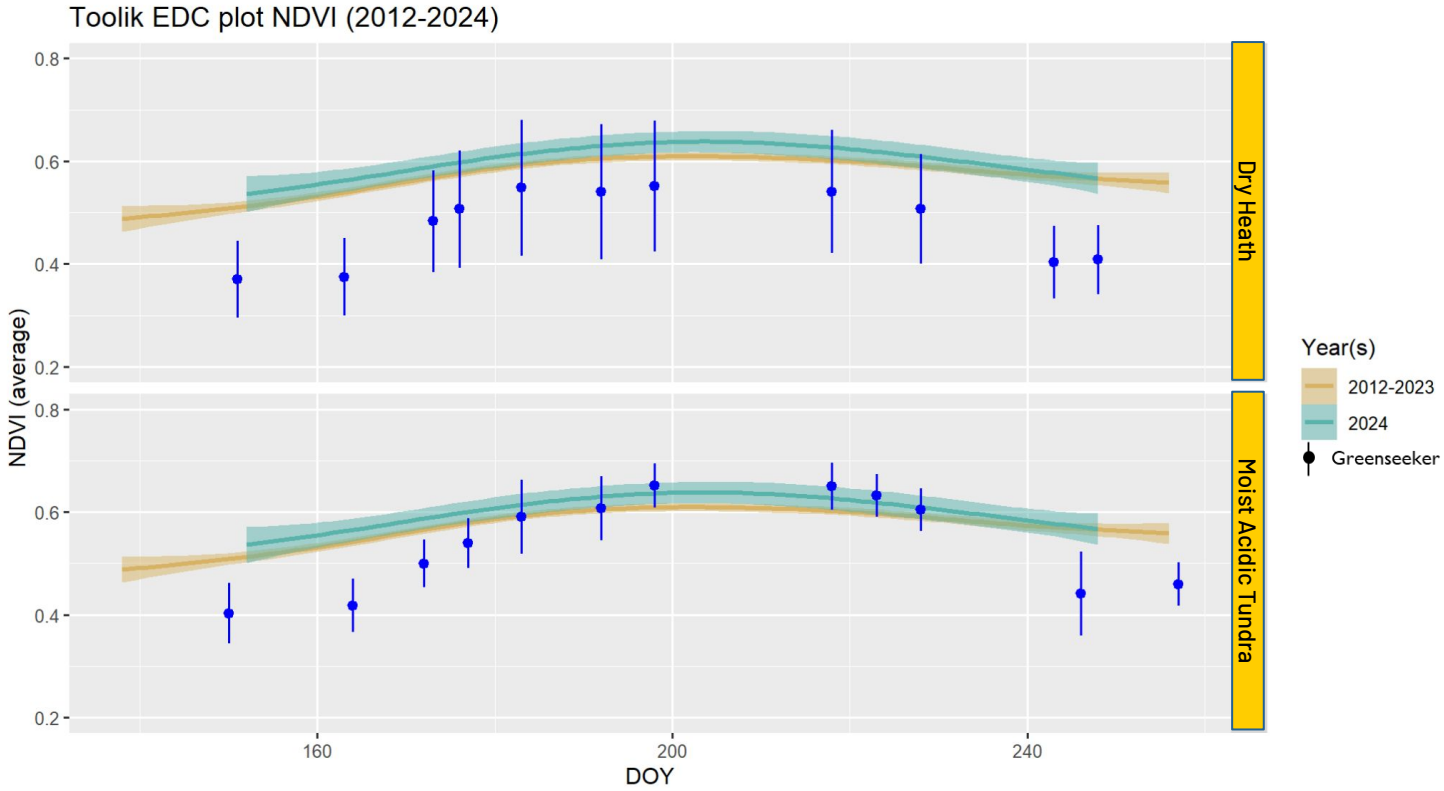
Lightly used, or never used lab and field supplies: pin flags, nalgene bottles, glassware, scint vials, pipette tips, syringes, etc.

Baseline Monitoring
Biotic

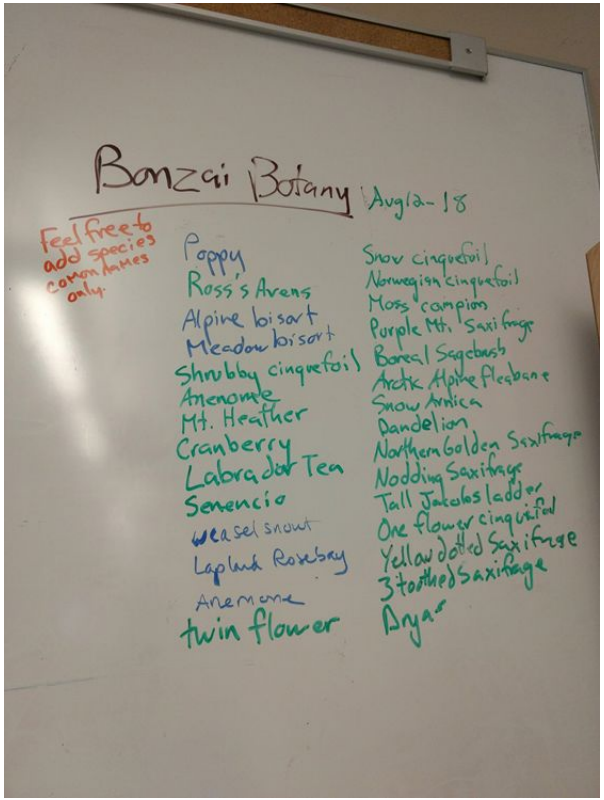
Biological Monitoring - Phenology



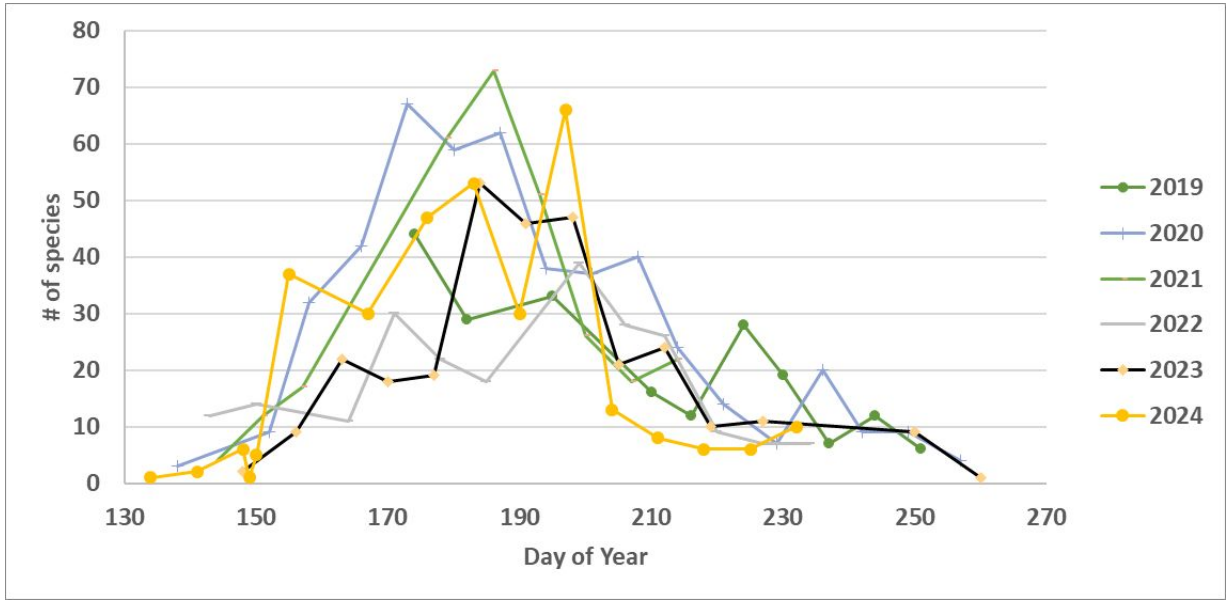
Biological Monitoring - NDVI



Biological Monitoring - Bonsai Botany

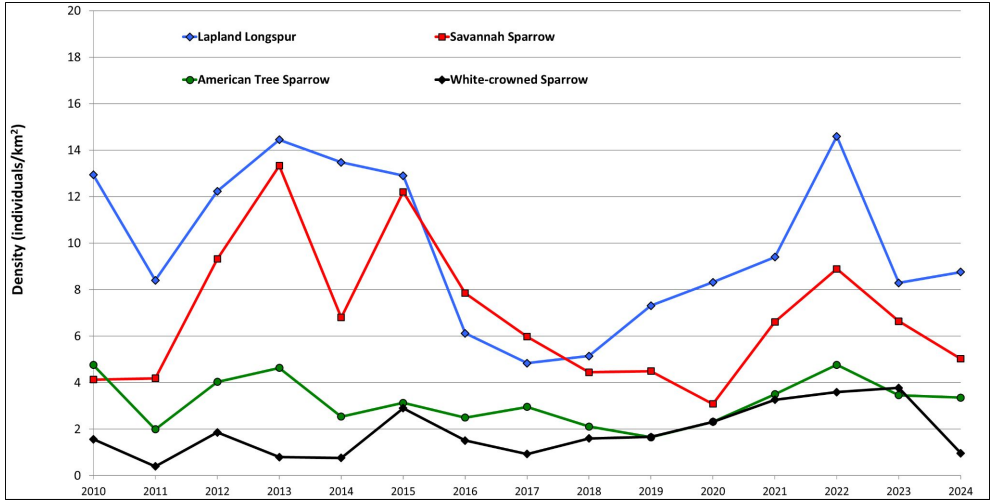


- Recorded plants in flower during each week
- Common names only so all can participate

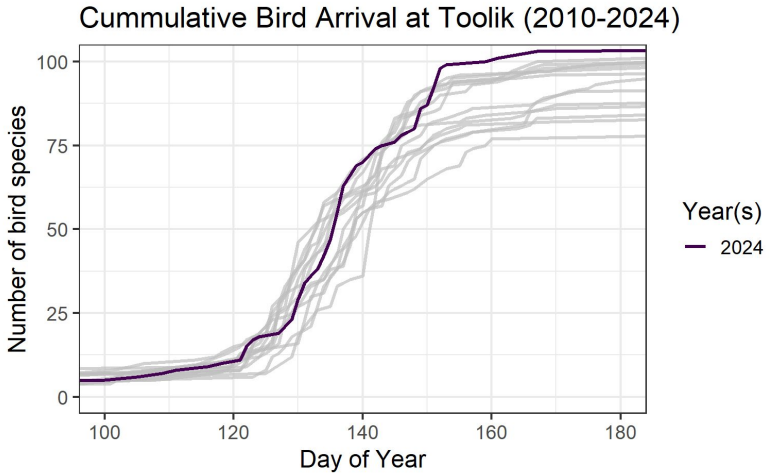


Biological Monitoring - Avian

- Avian point counts



- Date of arrival of bird species from the Naturalist Journal

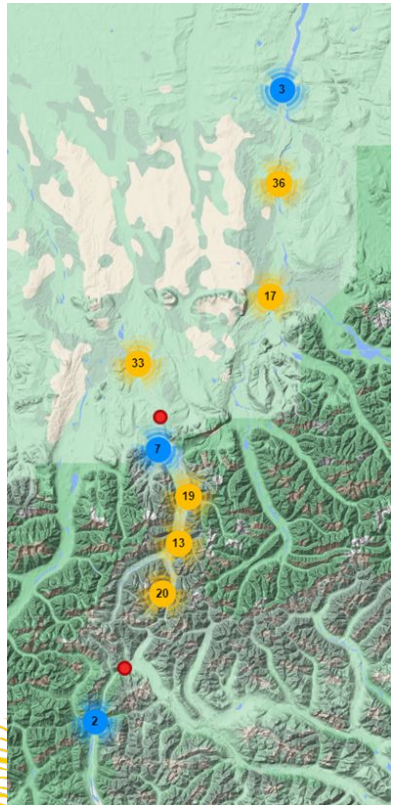


Biological Monitoring - Audio Recordings

- Audio recording of bird species continues now with 252 recordings from the Toolik area
  - Up from 212 last year
  - Calls are added to the Naturalist Bird Guide

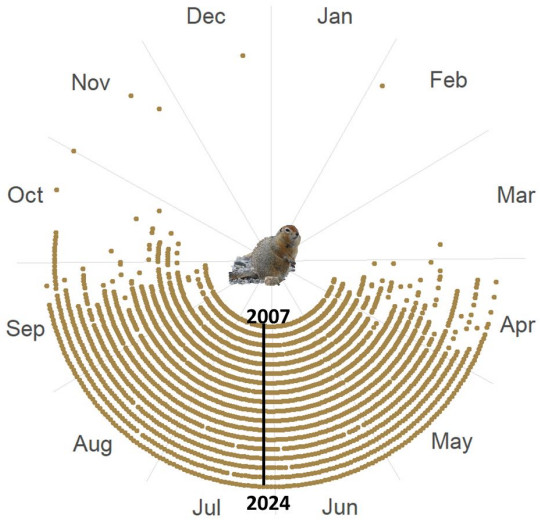
Northern waterthrush, June 2022

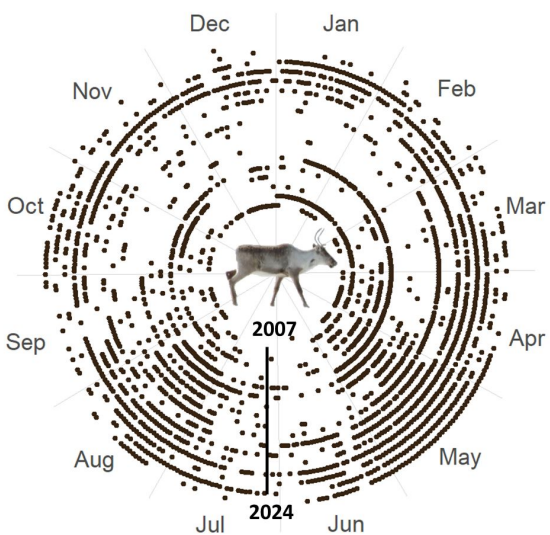
Surfbird (Mt Dalton), June 2022

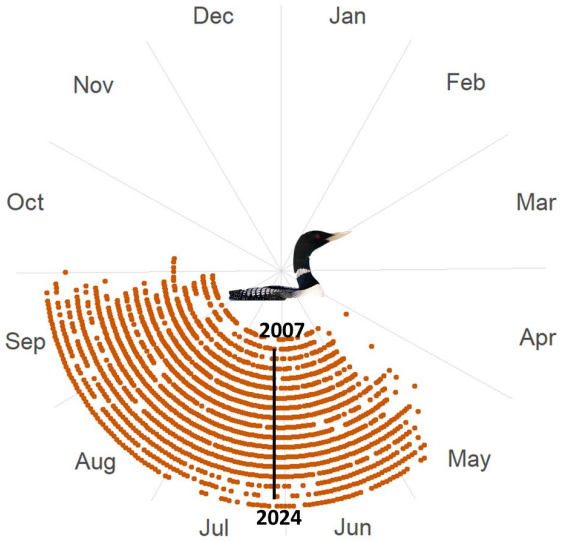


Biological Monitoring - Animal Observations

- Daily observations from the Naturalist Journal showing observed presence on the landscape.
  - Each ring is a year and each dot is a daily observation.





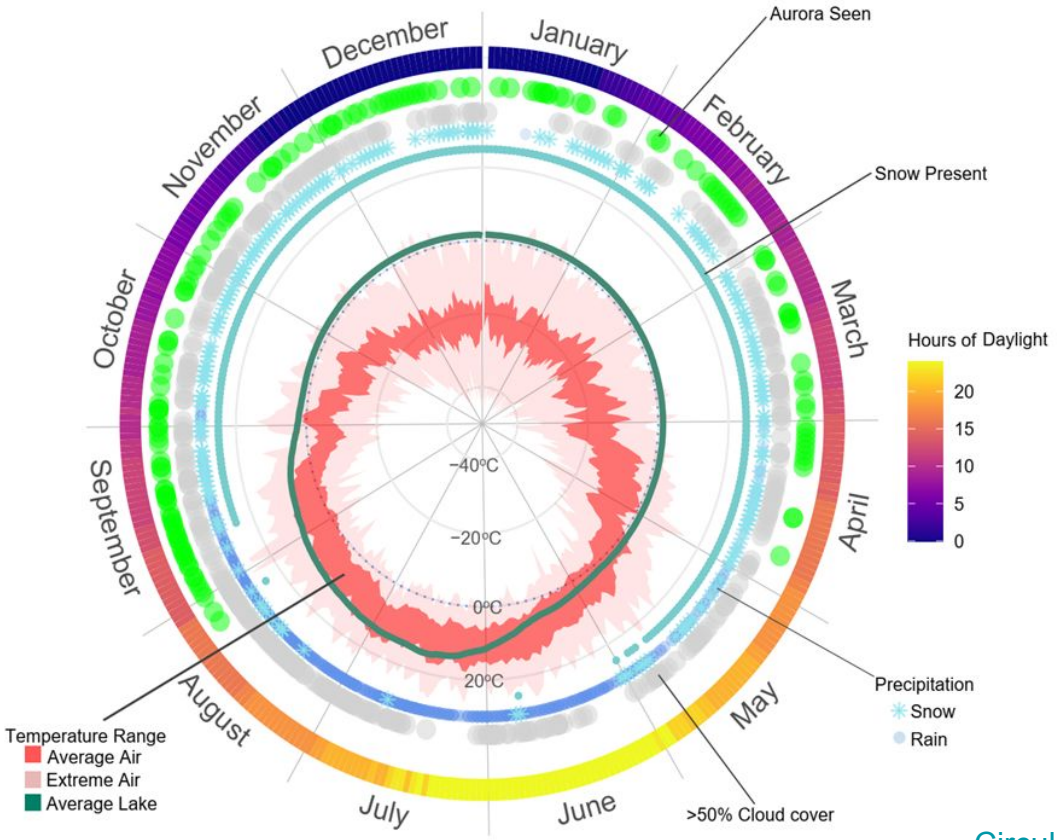


[Interactive Animals & Birds Tool]

Baseline Monitoring
Abiotic

Through the year at Toolik

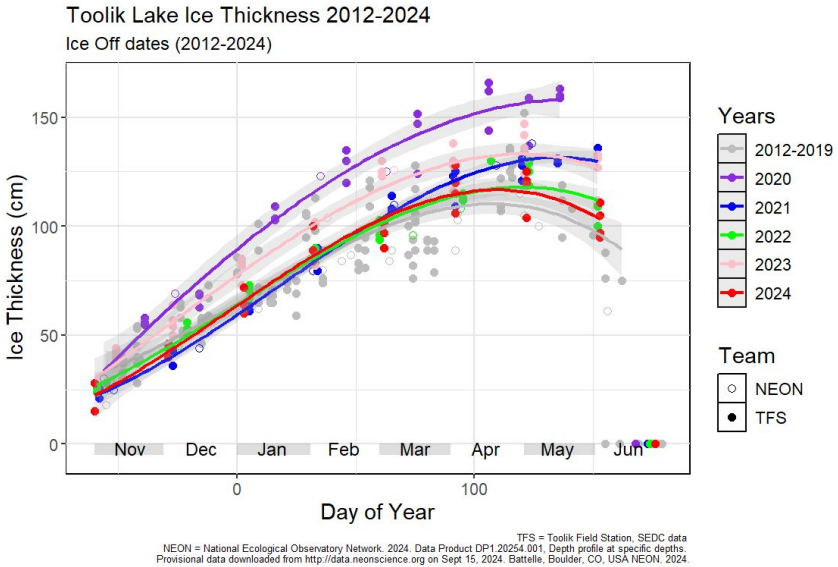
Data from the TFS Met Station and Naturalist Journal (2007-2021)



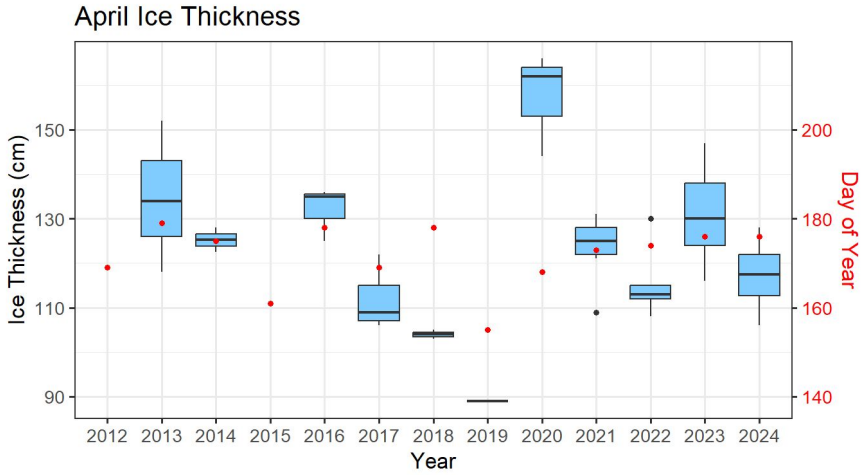
[Circular Seasonality Plots GitHub code]

Abiotic Measurements - Ice Thickness

- Ice thickness - measured monthly

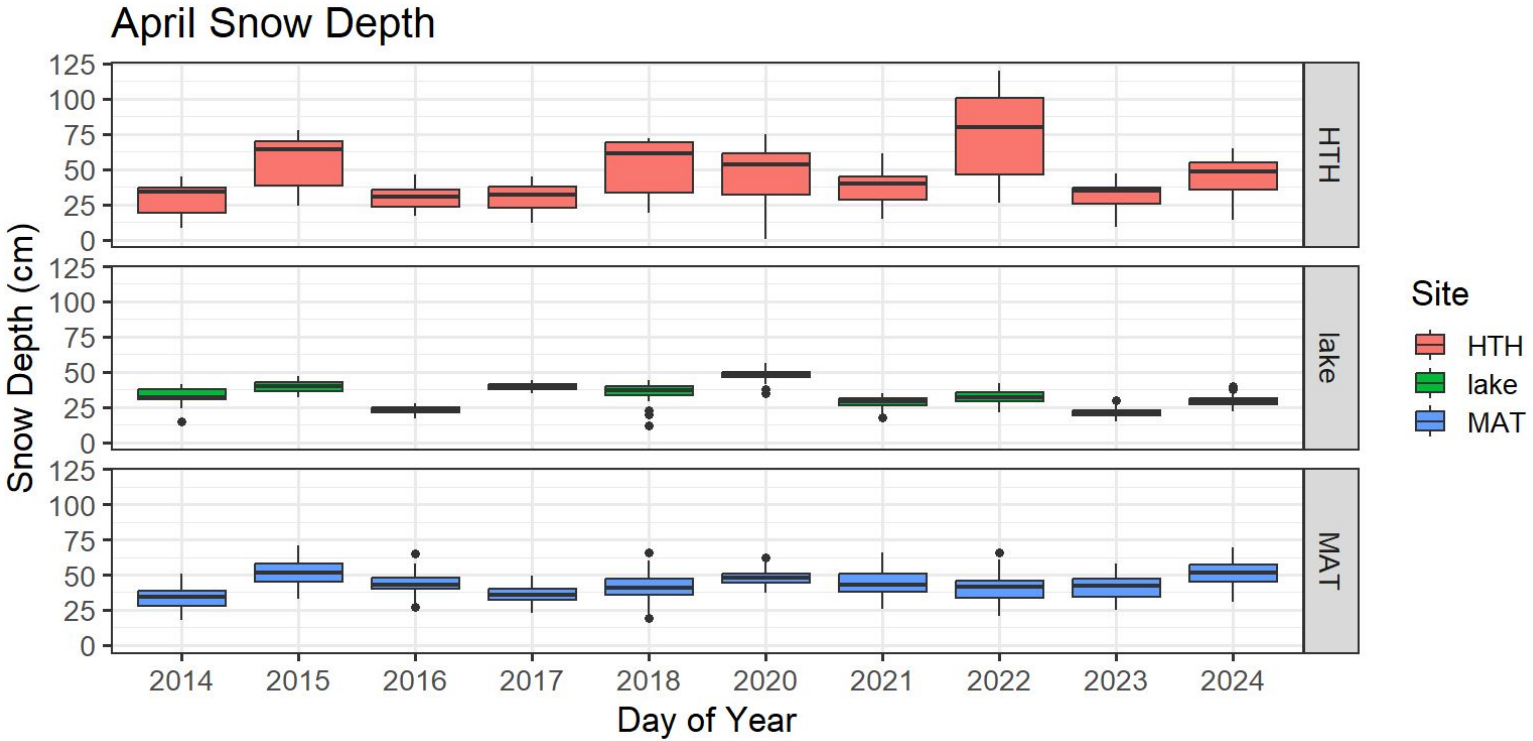


- Peak ice thickness, measured in April



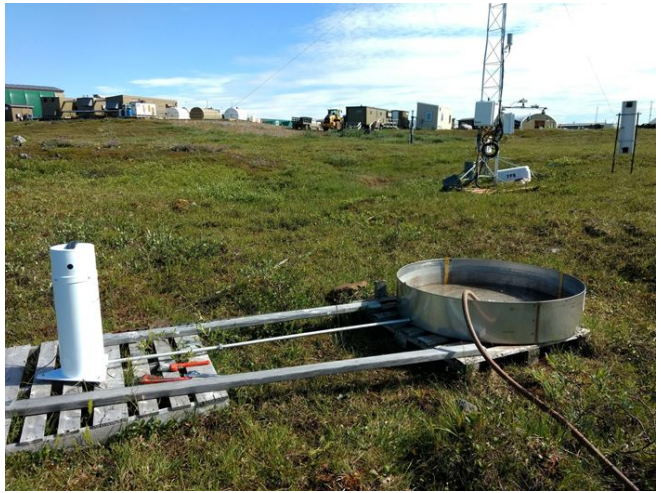
Red dots are dates of ice off (secondary y-axis)

Abiotic Monitoring - April Snow Depth



Met Station Report

- TFS Meteorological Data updates
  - In 2024 QAQC began to occur quarterly. Final quarter of 2024 is in progress.
- Frequent communication between Colin Edgar and other EDC staff to troubleshoot issues and installation as they arise.
- Sensor Upgrades in 2024
  - DC power to Toolik Main Met Station and Flux Hut
  - Data Logger installed at Flux Hut
  - Leveling Flux Hut Tower



Climate Summaries and Comparisons

Climate Summaries

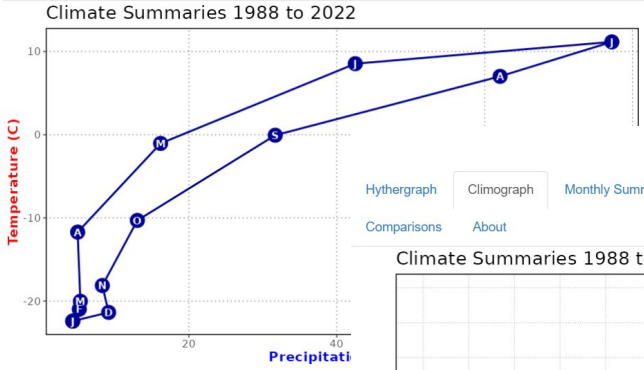
Create climate summaries by selecting a date range of interest

Year

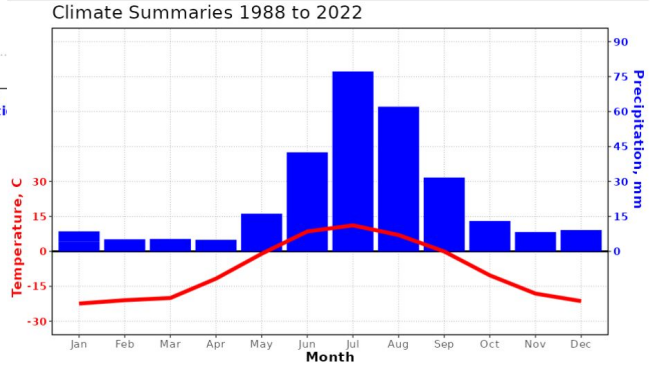
1988 2022

1988 1992 1996 2000 2004 2008 2012 2016 2020

Hythergraph Climograph Monthly Summaries Seasonal Summaries Yearly Summaries Comparisons About



Hythergraph Climograph Monthly Summaries Seasonal Summaries Yearly Summaries Comparisons About



Hythergraph Climograph Monthly Summaries Seasonal Summaries Yearly Summaries

Month	Temp (Mean)	Precip (Sum)	% Temp Data	% Precip data
January	-22.40	4.29	98.24	50.93
February	-20.97	5.18	97.00	49.36
March	-20.02	5.32	96.97	44.87
April	-11.71	4.96	94.71	55.59
May	-1.05	16.17	94.97	82.54
June	8.54	42.50	94.10	93.33
July	11.16	77.20	94.93	97.05
August	7.02	62.09	93.46	95.48
September	-0.06	31.68	99.80	89.80
October	-10.30	13.03	100.00	72.20
November	-18.13	8.30	100.00	66.86
December	-21.36	9.15	100.00	69.54

[Interactive climate summaries tool]

[Toolik climate summaries GitHub code]

Network Participation

Atmospheric Monitoring

- Ozone Monitoring – 2009 to Present (ADC repository of data)
- National Atmospheric Deposition program (NADP) – 2017 to present
  - National Trends Network
  - Mercury Deposition Network
  - Ammonia Monitoring Network
- Inter-agency Monitoring of Protected Visual Environments (IMPROVE) – 2018 to present
  - Re-funded by the BLM until 2064
- Purple Air – June 2019 to present
  - Particulate matter sampling
  - 2 additional sensors added in 2022
- Mercury Passive Air Sampler – January 2020 to present
  - Changed quarterly
  - Lower than average Mercury for the Arctic

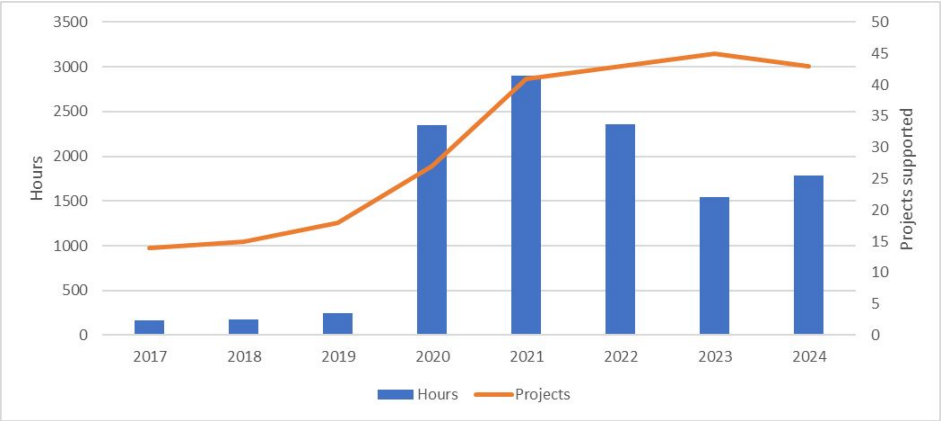
Network Participation

- LIFEPLAN – A Planetary Inventory of Life
  - Weekly spore sampling
  - Camera and audio traps
    - Community training of AI to process data
    - Audio traps
  - Malaise trap
  - Soil sampling
- myThaw
  - Weekly NDVI/snow survey transect
  - Thaw depth, veg height, snow depth
  - Data collected is online at permafrostthaw.org
- CoCoRaHS – Community Collaborative Rain, Hail & Snow Monitoring
  - Daily record of precipitation and snow water equivalency
- Aurorasaurus
  - Observations of aurora activity
  - Toolik is an Ambassador member
- Fresh Eyes on Ice
  - Monthly ice measurements

Remote Access

Field Work Assistance

- 2017: 170 hours of assistance to 14 projects for 14 different researchers.
- 2018: 179 hours of assistance to 15 projects for 14 different researchers.
- 2019: 242 hours of assistance to 18 projects for 29 different researchers.
- 2020: 2344 hours of assistance to 27 projects
- 2021: 2899 hours of assistance to 41 projects
- 2022: 2361 hours of assistance to 43 projects
- 2023: 1543 hours of assistance to 45 projects
- **2024:1783 hours of assistance to 43 projects**

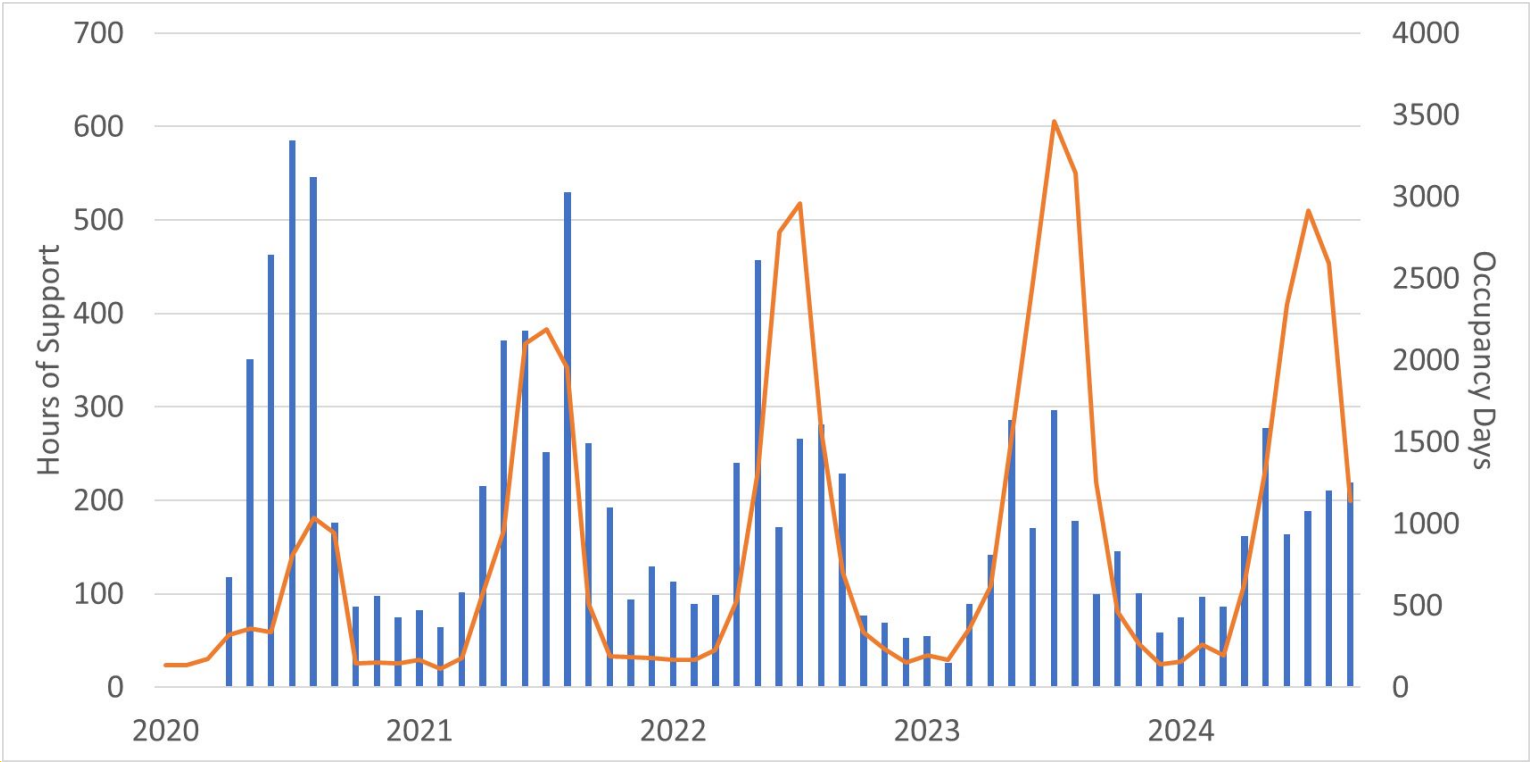


Examples of assistance (Not exhaustive):

- Met Station setup, downloads, and troubleshooting
- Phenology and NDVI measurements
- River discharge and water chem processing
- Soil sampling
- Tussock tiller measurements

*Not all projects supported have hours recorded

Support Hours Through Sept 2024



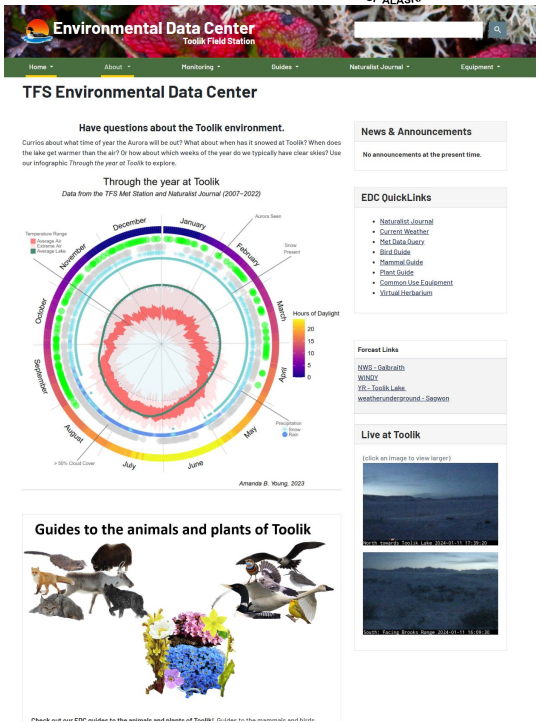
Winter Remote Access

- 20-40 hours of remote access per week.
- EDC staff at Toolik year-round working with Maintenance staff
- Activities:
  - Autonomous equipment
    - Preventative maintenance checks
    - Data download
    - Power system charging and repairs
    - Sensor swap
  - Snow depth measurements
  - Lake ice
    - Ice thickness measurements
    - Sonde casts
    - Water sampling and filtering
  - Atmospheric measurements
  - Access assistance via snowmachines

Other

EDC Website

- Abiotic
  - Weather
  - Met Station Data Query
  - Snow
  - Ice Thickness
  - Atmospheric
  - Time Lapse
  - Other
- Biotic
  - Bird Point Counts
  - Plant Phenology
  - NDVI Measurements
- Guides
  - Mammals
  - Birds
  - Fish
  - Plants
  - Virtual Herbarium
- Naturalist Journal
  - Annual Summaries



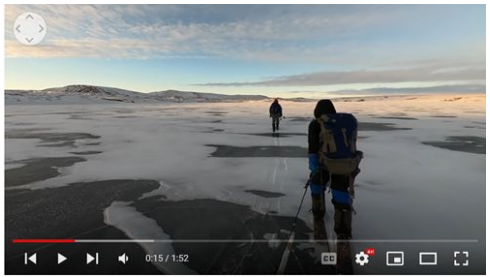
What do you wish to see added?

Meetings and Outreach

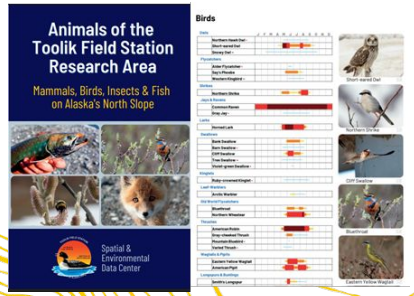
- Meetings
  - American Geophysical Union
    - Exhibit Hall booth
  - ICARP IV
    - International Conference on Arctic Research Planning
  - Organization of Biological Field Stations Annual Meeting
- Tours of Toolik
  - North for Science!
  - Artists in Residence

Outreach Deliverables

- Immersive videos (360˚ & VR)
  - Link – best viewed in a VR headset or smartphone with resolution set to 4k



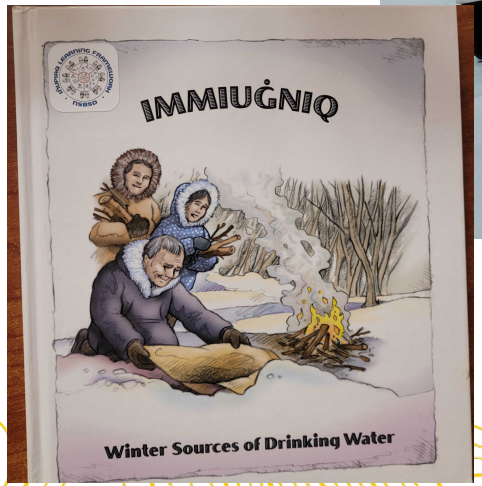
- Toolik Animal Checklist



What other kinds of deliverables would you like to see?

Meetings and Outreach

- Anaktuvuk Pass School Visit
  - April 22-25, 2024
  - Snow Science Curriculum based off of the Fresh Eyes on Ice but for snow
  - K-12 students, primarily with 7-8th grades
  - Home room teacher & Inupiaq teacher



Trainings & Workshops

- ADC - Fundamentals in Data Management for Qualitative and Quantitative Arctic Research (spring 2024 Abby)
- ADC - Reproducible Approaches to Arctic Research Using R (Spring 2024 Mayra)
- Polar Geospatial Center - Getting Started with PGC Data Workshop (Spring 2024 Abby)
- The Virtual Field (2023-2024)
    - Online (Amanda, Haley, Mayra), in person meeting (Mayra summer 2024)

Upcoming

- Avalanche Training (Spring 2025 Abby)

Let me know if you have any feedback

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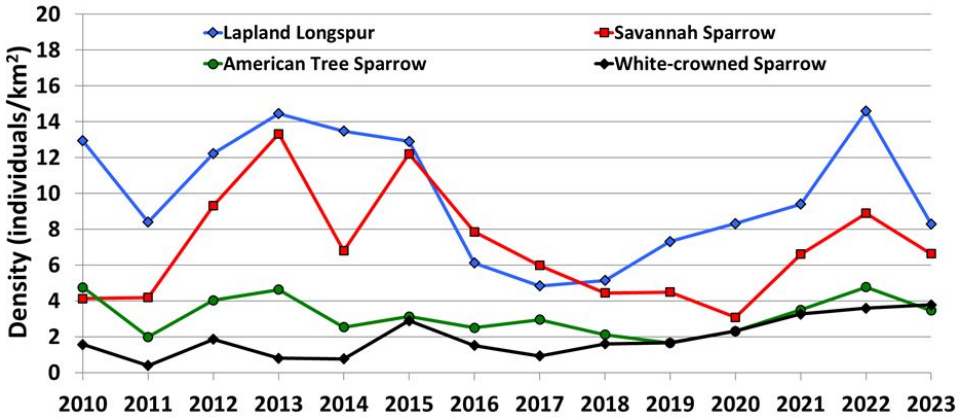
uaf-iab-toolik-edc@alaska.edu

Baseline Datasets



Remote Access and Field Support